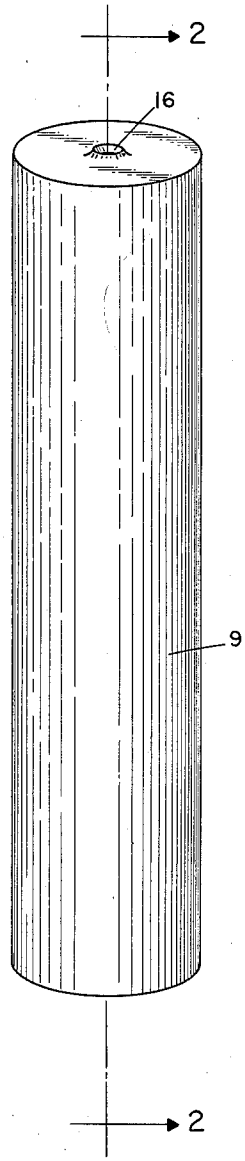
73-131 CROSS REFERENCE SEARCH ROOM

May 2, 1961 J. E. SHELTON ET AL 2,982,704

ENCASEMENT OF UNCONSOLIDATED OIL RESERVOIR ROCK SAMPLES

Filed May 5, 1958

FIG. 1.



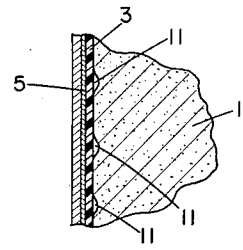




FIG. 3.

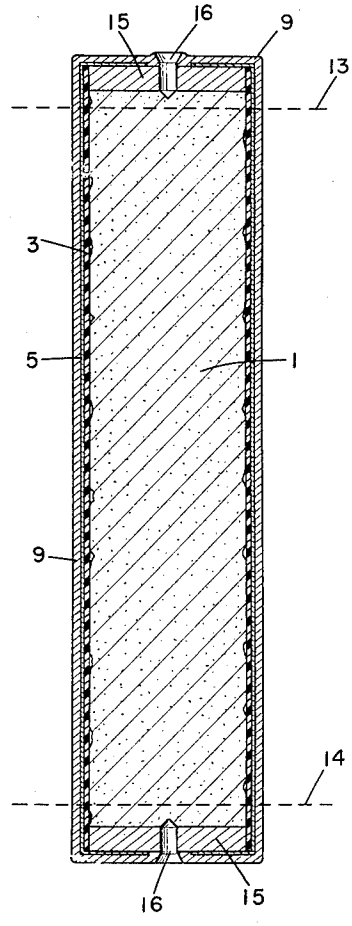



FIG. 2.

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# ENCASEMENT OF UNCONSOLIDATED OIL RESERVOIR ROCK SAMPLES

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2 Claims. (Cl. 204—20)

This invention relates to the analysis of earth formation samples, and more particularly to the preparation of friable earth formation samples, particularly core samples taken from oil and gas wells, for analyses involving the subjection of the samples to pressure, heat, and chemical reactions.

In connection with the drilling of oil and gas wells, it is customary to obtain at periodic intervals samples of the strata through which a well is being drilled. The purpose of obtaining such samples is to ascertain various properties of the strata. In order to measure the characteristics of the core, it is often necessary to subject the core to pressures of at least 200 p.s.i., to temperatures of about 250° C. and to the action of various chemicals, such as solvents. When the cores consist primarily of rocks, clays, or other well consolidated earth materials, no particular problems are encountered with regard to the handling of the core. However, when the cores consist primarily of sand and other friable substances, it has been found difficult, if not impossible, to work with the cores so as to obtain significant data therefrom. When such cores are subjected to pressures and temperatures of an appreciable magnitude, they almost invariably disintegrate before any appreciable amount of data can be determined.

The invention will be best understood from the following description thereof when taken in connection with the accompanying drawing, wherein:

Fig. 1 is an elevational view illustrating a core of earth material treated in accordance with the present invention;

Fig. 2 is a cross-sectional side view of the treated core shown in Fig. 1; and

Fig. 3 is an enlarged view of a portion of Fig. 2 for the purpose of illustrating the relationship of certain of the constituent parts of the invention.

In accordance with the teachings of the present invention, an earth formation core **1** is initially coated with a plastic material **3** that will seal the surface of the core without entering the intergranular void spaces **11** (Fig. 3) in the surface thereof. The coating should be impermeable to fluids and should harden at room temperature and pressure. A preferred embodiment of the invention utilizes a mixture of litharge and glycerin for this purpose. An electrically conductive material **5** (Fig. 2) is thereupon painted or otherwise deposited on the plastic coating of the core. A metallic layer **9** is thereafter deposited on the electrically conductive surface by electro-deposition. The thickness of this final coat should be between 1 and 2 millimeters when applied to 1 inch diameter core samples. Proportionately thicker final coats should be applied on larger diameter core samples.

It is very important that the initial coating on the core should not enter into the pore spaces, voids, or pockets in the core and in the surface of the core. Should the coating material enter into the intergranular porosity through the surface pockets **11** (Fig. 3), the



porosity and permeability of the core will be altered to some extent, and the results of subsequent porosity and permeability measurements will be erroneous. The peripheral area of the core (including the end plates **15** [Fig. 2]) should be coated with the material so that the fluids used in the electro-deposition of conductive metal will not enter the intergranular porosity or react with the rock material. End plates may not be required where the core sample has some degree of solidity, in which case the entire external surface of the core is initially coated. As mentioned above, a mixture of litharge and glycerin has been found to be an extremely satisfactory material for the initial coating. A mixture of litharge and glycerin is capable of withstanding high temperatures, is unaffected by petroleum derivative solvents, and may be applied and hardened without the necessity of application of heat and pressure that would alter the characteristics of the core. Litharge (or lead oxide) and glycerin react chemically at room temperatures and pressures to form a hard, impermeable surface coating. While lead oxide in admixture with glycerin is disclosed as a specific example of a material that may be used, other materials may be used that have the physical and chemical properties set forth above. Litharge and glycerin admixtures are well known in the art as will be found in "The Chemical Formulary," H. Bennett, editor, New York, D. Van Nostrand Co., Inc., 1935, vol. II, pages 36 and 37, where weight ratios of 3 to 3¾ parts of litharge to 1 part of glycerin as well as a ratio of 50 parts of litharge to 30 parts of glycerin are disclosed.

The conductive coating **5** (Fig. 2) applied to the initial layer may be metallic silver powder in a suitable volatile carrier and adhesive such as is disclosed in the publication "Metallizing Non-Conductors" by Samuel Wein, published by Metal Industry Publishing Company (1945). Other materials may be utilized. The coating should be quite thin, but should be sufficiently conductive so that electro-deposition thereon may be readily effected.

The electro-deposition of a copper metallic sheath on the first conductive coating may be accomplished by conventional means. The entire body may be immersed in a solution of copper sulphate and sulphuric acid, and a direct current source may be connected between the body and a copper electrode that is also immersed in the solution. Other metals, such as nickel, silver, and gold may be utilized in conjunction with appropriate electroplating solutions following techniques well known in the electroplating art.

After the final metallic layer has been deposited to the required thickness, small sections of the end of the core may be removed, as indicated by dashed lines **13** and **14** (Fig. 2). The core will now be in a condition for analysis involving high pressures, high temperatures, and the application of solvents specified above. Where the sand is exceedingly friable, the machined brass end plates **15** (Fig. 2) may be left in place and a hole **16** drilled through the end plate into the core.

If the original core is too large for convenient handling or is of irregular shape, the core may be cut to a convenient size. A satisfactory core size may be a cylinder between ⅞ and 1 inch in diameter, and between 1½ and 2½ inches in length. Larger core sizes may be used where applicable.

A core consisting primarily of sand particles, after being treated as specified above, was subjected to temperatures in excess of 250° C., to pressures of up to 450 pounds per square inch, and to solvents such as benzene and methanol. The sand particles remained in their initial consolidated condition, and the protective

coating was found to be virtually unaffected by the heat, pressure, and solvents to which they were subjected.

Although the embodiments disclosed in the preceding specification are preferred, other modifications will be apparent to those skilled in the art which do not depart from the broadest aspects of the scope of the invention.

What is claimed is:

1. A method for preparing friable earth samples for analysis involving the subjection of said friable earth samples to pressures of at least 200 p.s.i., to temperatures of at least 250° C., and to petroleum solvents, comprising: cutting said samples to a generally cylindrical shape; thinly coating said samples with lead oxide in admixture with glycerin; reacting the lead oxide-glycerin mixture for a time interval of sufficient duration for the mixture to harden; applying to the hardened coating a second coating of an electrically conductive paint; and electrodepositing on said samples a conductive metal to a thickness of at least 1 millimeter.

2. A method for preparing friable earth samples for analysis involving the subjection of said friable earth samples to pressures of at least 200 p.s.i., to temperatures of at least 250° C., and to petroleum solvents, comprising: cutting said samples to a generally cylindrical shape, placing a metal end plate at each end of



the cylindrical sample; thinly coating the sample and metal end plate with lead oxide in admixture with glycerin, and reacting the lead oxide-glycerin mixture for a time interval of sufficient duration for the mixture to harden; applying to the hardened coating a second coating of an electrically conductive paint; electrodepositing on said samples a conductive metal to a thickness of between 1 millimeter and 2 millimeters; and drilling a hole at each end of the cylinder through the end plates.

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